REMARKS

Claims 1-14 stand rejected under 35 USC 103 over Driessen et al in view of Summers et al.

The present invention is concerned with a technique for avoiding loss of data in a simplex (i.e. one-way) telemetric measurement system. In the illustrated embodiment of the invention, a transducer 10 develops a binary electrical signal having a characteristic, such as pulse frequency, that varies as a function of a variable of interest, such as temperature. A measuring device 20 measures the value of the characteristic, calculates a temperature value, and generates a digital word representing the calculated temperature value. The calculated value is loaded into a memory cell 32. On the next cycle of operation, the digital word currently stored in the memory cell 32 is shifted to a second memory cell 34 and the digital word representing the next value is loaded into the memory cell 32. A packetizer 28 constructs a transmission packet that includes the digital words read from the memory cells 32 and 34, generates a packet signal that represents the bit sequence of the packet, and supplies the packet signal to a radio transmitter 36 which transmits the packet signal.

A receiver 40 receives the transmitted packet signal and outputs the digital reception signal to a packet recognizer 56. The packet recognizer identifies a transmitted packet and passes the payload bits (including the digital words read from the memory cells 32 and 34) to a depacketizer. The depacketizer 60 and a validator 62 recover the temperature values and make them available to an output device controller.

As stated in claim 1, the packetizer receives a succession of measured values from a measurement device and generates a succession of transmission packets each including a more recently measured (or later) value and a less recently measured (or earlier) value. Thus, we have a succession of values V1, V2, V3, etc. and a succession of packets P1, P2, P3, etc. Each packet includes a later value and an earlier value. If we arbitrarily associate the values Vi and V(i-1) with the packet Pi as the later value and the earlier value respectively, claim 1 requires that packet P2 contain V1 as the earlier value and V2 as the later value, and that the next packet P3 contain V2 as the earlier value and V3 as the later value.

Accordingly, the packet structure preserves the time relationship of the measured values, such that it is possible to determine without ambiguity which is the earlier value and which is the later value. This elimination of ambiguity is important in some applications, such as physiological measurements, where body temperature, heart rate and blood pressure, for example, do not normally vary in a predictable fashion. It will be understood that in other applications, such as monitoring the temperature of a furnace during heat up or cool down, or monitoring cumulative energy consumption, the measured values vary in a predictable fashion and the order of the values can be inferred from the values themselves.

Driessen et al is concerned with transmitting data over a channel and efficiently minimizing the impact of corruption of the data during transmission. Driessen et al discusses three techniques for minimizing the impact of data corruption: error mitigation (or error concealment) replaces corrupted data with interpolated data, forward error correction uses redundant codes that permit errors to be detected and corrected to recreate the transmitted data, and retransmission involves detecting errors and requesting a retransmission. Driessen et al points out that forward error correction and retransmission both require additional bandwidth and seeks to minimize the amount of additional bandwidth required without excessive compromise in the quality of transmission.

Driessen et al discloses a method for transmitting data in which input data packets are categorized in accordance with, for example, importance of the data packets and a single category bit is associated with each input data packet.

Driessen et al appears to disclose that the framing circuit 111 receives input data and assembles sufficient data in a buffer to form a frame. The categorizing circuit 112 receives the frame of data from the framing circuit and generates a category bit reflecting the category of that frame of data. The packetization circuit 114 builds packets for transmission. Referring to FIG. 7, eight category bits C1-C8, reflecting the categories of data packets P1-P8 respectively, are assembled into a category byte, and this category byte is transmitted with each of the packets P1-P8. It appears that a category byte CB containing category bits C9-C16 is transmitted with each of the data packets P9-P16.

It appears that the examiner considers that the category bits C1-C8, etc. are apt counterparts for the measured values recited in applicant's claims. Applicant respectfully disagrees. The category bits C1-C8 are not derived by measuring the data content of the packets P1-P8 but are assigned to the packets based on a characteristic of the data other than its content. For example, if the data of the packet P1 is of high importance, the corresponding category bit C1 might be 1; and if the data of the packet P2 is of lower importance, even if the data itself is identical, the category bit C2 might be 0. Driessen et al does not disclose or suggest that the contents of the packets P1-P8 can be reconstructed from the category bits C1-C8.

Claim 1 requires that the measured values be included in the transmission packets.

The disclosure of Driessen et al is not clear with respect to whether the category byte CA, for example, is included in a packet with the data bits that form the packet P1, for example, since FIG. 7 shows the byte CA as distinct from the packet P1.

Summers et al is concerned with a data transmission system for automated collection of utility meter data. FIGS. 1 and 2 of Summers et al each disclose utility usage nodes 100 (i.e., utility meters) connected to respective wireless telemetry monitoring modules 40. Each module 40 collects usage information from its associated meter and forwards that information to a central monitoring station. As stated at column 4, lines 10-14, the usage data transmitted in each transmission may also include redundant data previously transmitted. The examiner relies on the passage at column 4, lines 10-14 of Summers et al as suggesting that it would have been obvious to a person of ordinary skill in the art to modify the system disclosed by Driessen et al to arrive at a transmitter in accordance with claim 1. Applicant respectfully disagrees with the examiner's analysis.

In support of the rejection, the examiner asserts that the packetizer of Driessen et al receives the measured values (presumably the category bits C1-C8) and generates a succession of transmission packets (presumably CA+P1, CA+P2, CA+P3, etc.) each including a more recently measured value (C4, say) and a less recently measured value (C3). In order to meet the requirement of claim 1 that the more recently measured value that is included in an earlier packet is

included in a later packet as the less recently measured value, it would be necessary that the composition of the category byte be changed for each successive data packet. For example, the category byte associated with packet P1 could contain the bits C1-C8 whereas the category byte associated with the packet P2 should contain the category bits C2-C9. In this case, the more recently measured value (C2) that is included in the earlier category byte (C1-C8) is included in the later category byte (C2-C9) as the less recently measured value. Regardless of the disclosure of Summers et al, applicant submits that this proposed modification of the disclosure of Driessen et al would not have been obvious to a person of ordinary skill in the art. For example, it appears from FIG. 7 of Driessen et al that the packetization circuit 114 builds a frame or superpacket containing eight data packets P1-P8 and eight occurrences of the category byte CA. Generally, at the receiver, a given packet, e.g. packet P3, will be treated in accordance with bit 3 of the associated category byte CA. If the category byte associated with packet P3 should be corrupted, the packet P3 may be treated in accordance with the bit 3 of any other category byte in the frame. However, if the category bits forming the category byte changed from packet to packet (a moving group of eight consecutive category bits including the category bit associated with the particular packet), the receiver would have to know the time relationship between the packet P3 and the packet containing the non-corrupted category byte in order to determine the position of bit C3 in the category byte. Moreover, use of a moving group of eight category bits implies that a frame structure could not be employed for data transmission because each frame would contain category bits not only for its own data packets but also for data packets of the preceding and succeeding frames.

The examiner asserts that Summers et al discloses that a more recently measured value that is included in an earlier packet may be included in a later packet as the less recently measured value. The examiner's assertion goes well beyond the disclosure at column 4, lines 10-14. Thus, in Summers et al, one would expect that the usage information will in fact be the current meter reading. Since the meter reading increases monotonically with time, there is no ambiguity over which is later and which is earlier, and accordingly there is no

need to associate meter readings taken at different times with different positions in a data packet.

In any event, to the extent that the examiner considers that the category bits of Driessen et al are apt counterparts of the measured values in applicant's claims, Summers et al does not add anything to the disclosure of Driessen et al because Driessen et al discloses that the category byte CA is transmitted repeatedly and Summers et al does not disclose or suggest that a more recently measured value that is included in an earlier packet may be included in a later packet as the less recently measured value.

The paragraph starting at column 19, line 52, of Summers et al refers to interval consumption data but explains that the interval consumption data is aggregated. Therefore, there is no need to preserve information regarding the sequence of the interval consumption data values.

The fact that Summers et al mentions that a transmission may include redundant data previously transmitted does not imply that a more recently measured value that is included in an earlier packet may be included in a later packet as the less recently measured value. In the absence of more detailed explanation, in an application like that of Summers et al where it is desired "to create a profile of consumption" (column 19, lines 53-54) it would not be sufficient to know the sequence in which values were measured. For subsequent processing it would be necessary to know the time at which a consumption value was measured, and so it would be expected that the monitoring module would transmit (time, consumption) doublets. Since time values would be explicitly available, there would be no incentive to provide sequence information implicitly, as set forth in applicant's claims.

In view of the foregoing, applicant submits that Driessen et al and Summers et al do not disclose or suggest the subject matter defined by claim 1, and specifically do not disclose or suggest the feature whereby the more recently measured value that is included in an earlier packet is included in a later packet as the less recently measured value. Applicant therefore submits that claim 1 is patentable, and it follows that the dependent claims 2-5 also are patentable.

Claim 6 is directed to a receiver unit that includes a packet check means having two modes of operation depending upon whether a sequence of bits meets a predetermined standard. If the sequence of bits meets the standard, the packet check means recovers a more recent datum from the sequence of bits. If the sequence of bits does not meet the predetermined standard, the packet check means enters a data recovery mode and determines whether a sequence of bits subsequently received meets the predetermined standard and, if so, recovers both a more recent datum and a less recent datum from the subsequent sequence of bits. The examiner relies on the description in paragraphs [0039]-[0042] of Driessen et al as meeting the limitations of claim 6.

Claim 6 refers to recovery of a more recent datum from a sequence of bits and the possibility of recovering both a more recent datum and a less recent datum from a subsequent sequence of bits. Claim 6 does not mention any possibility of calculating or inferring a datum from one or more data that have been recovered.

Paragraph [0041] of Driessen et al is concerned with error mitigation, which is defined in paragraph [0007] as techniques for replacing corrupted data with interpolated data. As stated in paragraph [0007], error mitigation is sometimes known as error concealment. Claim 6 is not concerned with error mitigation, and therefore paragraph [0041] of Driessen et al is irrelevant to claim 6.

Paragraphs [0040] and [0042] of Driessen et al discuss error correction. Error correction is a set of techniques employing redundant data to permit reconstruction of the information data stream. In accordance with paragraphs [0040] and [0042], Driessen et al teaches that if the packet P2, for example, has been corrupted and the category bit indicates that forward error correction is required in order to reproduce the original signal, then the error correction circuit 143 can use any forward error correction data that is available to correct the corrupted data. What is missing from paragraphs [0040] and [0042] of Driessen et al is any hint as to how this might be done. Driessen et al does not disclose or suggest that the packet P3 partially duplicates the packet P2 such that if a later value in packet P2 is degraded, an earlier value from packet P3 may be used in its place.

The examiner has not suggested how the disclosure of Summers et al is relevant to claim 6.

In view of the foregoing, applicant submits that claim 6 is patentable, and it follows that the dependent claims 7-9 also are patentable.

Claim 10 recites a transmitter unit and a receiver unit, the transmitter unit being in accordance with claim 1 and the receiver unit being in accordance with claim 6. Accordingly, the arguments presented above in support of both claim 1 and claim 6 are applicable to claim 10. Applicant therefore submits that claim 10 is patentable and it follows that the dependent claim 11 also is patentable.

The arguments presented above in support of claim 1 are also applicable to claim 12. Similarly, the arguments presented in support of claim 6 are also applicable to claim 13. Claim 14 combines the features of claims 12 and 13 and accordingly the arguments presented in support of claims 1 and 6 are applicable to claim 14.

Respectfully submitted,

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